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HINTS TO SETTLERS ON THE BELLE FOURCHE
PROJECT, SOUTH DAKOTA.

DESCRIPTION OF THE REGION.

The Belle Fourche Reclamation Project is located in the southwestern part of Butte County, South Dakota, and draws its water supply principally from the Belle Fourche and Red Water rivers, which are diverted into a reservoir from which two large canals carry the water on to the land. The topography of the area covered by the Project is gently rolling, with occasional flat areas of some extent. The Project will irrigate something over 90,000 acres of land, but owing to the rolling character of the ground, much of which lies above the ditch, the area included between the main canals considerably exceeds this acreage. This feature will enable many farmers to have both dry land and irrigated land in their farm units, and it is the intention of the Reclamation Service to so subdivide the land into units that each farmer will have as nearly 80 acres of each as the local topography will permit. The irrigated portion of each farm unit will usually vary from about 60 to 100 acres. The territory surrounding the Project is an open cattle range, the land being covered with a sod composed of western wheat-grass, buffalo grass, grama grass, and some wire-grass and small sedges. The soil, which has been formed principally through the weathering of cretaceous shale, is generally a heavy clay, though along the streams it is considerably lighter.

TREATMENT OF SOD LAND.

Where sod land is to be brought under cultivation, either above or below the ditch, it is advisable to break the land shallow rather late in the spring after the grass has started, especially on the heavy clay soils, but whether it is advisable to try to obtain a crop the first summer will depend somewhat upon the location of the land. Sod land on the lower lying creek and river bottoms or where there is no tendency to rapid surface drainage can probably be advantageously used for corn or flax on spring breaking. But if the land is on the high-lying prairie

(especially if north of the Belle Fourche River) it is practically useless to try to obtain a crop the first season without irrigation, and irrigation would be difficult on sod land the first season. If corn is planted on the sod some little fodder may be obtained, but certainly very little grain, if any, will be produced, and it is doubtful whether the fodder harvested will repay the labor involved. It should be kept in mind that this refers to the prairie uplands north of the Belle Fourche River rather than to the area south of it. It is an observed fact that more rain occurs south than north of the river, probably because the south side is benefited by the rains occurring in the Black Hills which are more frequent than those northward on the prairies. For instance, during the summer months of 1908 from April until September, Vale, a town on the Belle Fourche River, received 5 inches more rain than was recorded at the experiment station ten miles to the north during the same time.

For the new settler on the north side who comes on his land in the spring, it is a question whether it will not pay him better to break what land he can in the spring, disk it enough to close up the coarse air spaces so it will retain moisture during the summer, and then obtain work somewhere on the Project for the remainder of the summer. There is a fairly good demand for labor in connection with the work of the Reclamation Service and also on the farms already started. During the summer the land that has been broken should be kept in good condition by an occasional disking or harrowing, so that the sod will rot and be ready for backsetting in the fall. If the backsetting is not too deep (that is, not more than 4 or 5 inches) the soil can easily be worked into condition for winter wheat, which succeeds very well in the area. This procedure will probably prove better for the new settler than to stay on the farm the first summer with but small prospect of getting any returns from the land. If the new spring breaking is planted to a crop and the crop harvested without irrigation, the land will probably be too dry in the fall to be put into winter wheat.

PREPARATION OF THE SEED BED.

On land that has been previously broken, the seed bed for spring planting should be prepared as early as practicable. The plowing should, when possible, be done the previous autumn, so that the soil surface may be in condition to catch the early spring rains, thus preventing their running off of the surface. This is particularly applicable to the heavy gumbo soils, which if left in the compact condition over winter shed water quite effectually. If the land is plowed in the spring it is not advisable to plow deep, especially in the gumbo soils, as the subsoil turned up will not be in good condition for plant growth. It is important to harrow the land immediately after plowing, as this helps to establish a mulch which prevents undue loss of soil moisture and

tends to firm down the soil, thereby establishing good germinating conditions. The packing of the soil by harrowing will also prevent the wind from gaining free entrance to the plowed layer, and as the loss of moisture caused by the high winds which are prevalent in the spring is greater than the loss occasioned by the high summer temperature it is important to prevent this. If the land has been fall-plowed it should be gone over with a disk or harrow in the spring as soon as possible after the frost is out of the ground and the surface dry enough, in order to prevent the loss of moisture, to keep the surface from crusting, and to break up the clods.

EARLY PLANTING IMPORTANT.

The growing season at Belle Fourche is relatively short and spring crops should be started as early as conditions will permit. Such crops as wheat, oats, rye, and Canada peas will stand some spring frost without serious injury, and these crops can ordinarily be seeded with safety from the first to the middle of April. In 1908 the small grains on the experiment farm were sown about April 7, barley was sown 10 days later, and corn was planted May 7. A frost on May 20 did not materially injure any of these crops and the corn was matured nearly two weeks before the first frost in the autumn, which occurred on September 26.

While early planting does not result in a rapid early growth of top, yet the roots are getting well established in the soil, and the deep rooting gives the plants an advantage when later in the spring the temperature gets high enough for more rapid growth above ground. This is an important advantage in the dry-land soils. Of course seeding should not be done so early that the cold, wet ground will cause the seeds to rot, but the spring climatic conditions in the area are usually such that seeding may safely be done quite early. Seeding should, when possible, be done with a grain drill, as the seed can not be properly buried and surrounded firmly with moist soil by broadcasting, followed by harrowing or disking. As the seed bed in the heavy gumbo soil is likely to be somewhat rough, seeding should be deep. Wheat, oats, barley, rye, and peas should be put in about 3 inches deep, and a press wheel attachment on the grain drill should be used to pack the soil around the seeds, insuring an even germination and stand.

CROP VARIETIES.

The varieties of grain best adapted to the region have not yet been as definitely determined as is desirable, but a few varieties have shown themselves to be sufficiently well adapted to be recommended. The Kubanka variety of durum (macaroni) wheat is well suited to the region, especially on the dry lands. Fife and Blue Stem wheats also do well as spring wheats and should have the preference over the durum

varieties on the irrigated land. Three varieties of oats, Swedish Select, Kherson, and Sixty-Day are among the best so far known. For dry-land areas the preference seems to be in favor of Kherson or Sixty-Day oats, but the Swedish Select variety would probably be better for irrigated land, though as it produces considerable straw irrigation should be used rather sparingly. Among the winter wheats, Turkey Red, Kharkof, and Crimean are the best for the area. If soil conditions are right, fall seeding can be done from the first part of September to the middle or even latter part of October.

Among the various barleys grown, Hanna No. 6 has proved a good two-row variety, and while some of the hull-less barleys give promise of being valuable they can not yet be recommended. Of corn varieties so far tested, Minnesota No. 13 has been the best. For land which for any reason can not be seeded in early spring, proso is a good, quick-maturing catch crop which can be planted as late as June 5 to 15.

Potatoes should be given a place on every farm. A number of varieties are now grown locally. Among them the Early Rose, the Early Ohio, and the Blue Pitted varieties seem to be among the best. The quality of potatoes raised on the Project is good and the crop should be given considerable emphasis.

ALFALFA AND GRASS CROPS.

On favorable situations on the Project hay can be made from the native grasses, but as the land is settled the supply from this source will decrease and the increased demand for hay will need to be met by cultivated hay crops. Of the possible hay crops alfalfa appears to be the most promising. Very little has yet been done on the Project in the way of alfalfa production. It has been shown, however, that alfalfa is a success on the lighter soil types under irrigation. It is doubtful if it would succeed on the heavy upland gumbo without irrigation, or even with irrigation unless the subsoil is somewhat open. Alfalfa is a deep-rooted plant and on much of the heavier Belle Fourche land the subsoil is undecomposed shale which often contains enough alkali to inhibit the growth of alfalfa. It seems likely that western wheat-grass is better adapted to the heavy soils, especially in the lower places that receive the run-off from the surrounding slopes. These low-lying lands are not well suited to alfalfa, while wheat-grass does well on them. Some of this grass is being tried at the experiment farm, but it is yet too soon to know how it will succeed under artificial seeding.

SPECIAL POINTS ON ALFALFA GROWING.

It would not be advisable for the new farmer without previous experience to seed a large area of alfalfa. It should be planted on land that has been under cultivation for a year or two at least. When young, alfalfa is delicate and requires very favorable conditions, though when

once well established it becomes very hardy. It should be seeded from the middle to the last of May, at the rate of about 8 to 12 pounds per acre, without a nurse crop, and the moisture in the soil up to the time of seeding should be conserved by thorough tillage. Alfalfa should be seeded with a grain drill, if possible, to a depth of 1 to 1½ inches, and it can be harrowed lightly after it is several inches high if the conditions of rainfall and soil require it. Under irrigation it can be seeded heavier, 15 to 20 pounds to the acre, and, if desired, with a nurse crop of wheat or oats. In some instances alfalfa has done well when seeded early with the grain, but it will probably do better if seeded after the grain is up.

Some alfalfa seed is raised in the area, and if this is clean and sound it will pay to use it in preference to any other. If no local seed is available, care should be used to get seed of hardy northern-grown strains. Alfalfa fields may be greatly improved by surface cultivation in the spring, which not only hastens the early growth but postpones the time when the first irrigation is necessary. It may even be possible, if the season is favorable, to delay irrigation until just before the first crop is ready to cut. It is important that alfalfa be irrigated just before cutting rather than soon after. Alfalfa fields are often badly injured by scalding when irrigated just after a crop is removed, and much moisture is also unnecessarily lost before the plants become tall enough to shade the ground. When irrigated before cutting, the young shoots will begin growth while the crop is being removed and the second crop will make a quicker growth.

CONTROLLING THE SOIL MOISTURE.

One of the most important physical factors in agriculture and one which is to some extent within the farmer's control is the soil moisture. Its proper use and conservation should always be kept in mind whether the land is to be dry-farmed or irrigated. Irrigation insures moisture at the time it is needed, but irrigation is often seriously overdone. At least one irrigation can often be dispensed with to very great advantage to the crop by proper tillage in the spring to hold the moisture already in the ground at the time of seeding. Grain after it is well up can safely be harrowed with an ordinary steel harrow with the teeth slanting well back. Harrowing of grain after a rain loosens the soil surface, checks evaporation, and hastens the warming of the soil, which is necessary to plant growth.

By proper tillage both before and after seeding it seems highly probable that grain can be matured ordinarily with but one irrigation during the season. If grain has been planted deep with a grain drill it can be harrowed even when 5 to 6 inches high without serious injury. It is always inadvisable to irrigate grain crops early in the season unless it is absolutely necessary, and there will generally be enough moisture

in the ground to give the plants a good start if the spring moisture is properly conserved. Early irrigation, especially if carried on by the flooding system, will leave the surface of the ground in a hard, crusted condition, which permits the rapid escape of moisture from the ground and keeps the soil cold.

METHODS OF IRRIGATION.

The Reclamation Service expects to deliver, if required, about 24 acre-inches of water during the season, but it would be harmful to both crops and soil should the farmers actually apply that much water to their crops in addition to the rainfall. A wheat-grass meadow might tolerate that amount, but no other crop excepting possibly alfalfa with good underground drainage should be given that much water. Lands susceptible to the accumulation of alkali would be seriously damaged by the excessive use of water.

It is probable that for some time the flood method of irrigation will be more generally used in the area than any other. Owing, however, to the close texture and heaviness of so much of the soil, the furrow method would undoubtedly be the better one to use so far as the effect on the soil surface is concerned. If the land surface is fairly smooth, the field can be furrowed at a reasonably small expense.

A satisfactory furrowing implement can be made by fastening together several pieces of 4 by 6 inch or 6 by 6 inch timbers, parallel to each other, about 18 or 24 inches apart, with the edges facing the ground. When drawn over the field this will leave small V-shaped furrows several inches deep in which the water will flow quite readily for some distance. This method of irrigation has the advantage of the flooding method in that it leaves the soil surface between the furrows comparatively dry, and this dry surface acts as a mulch, preventing the rapid loss of the moisture which would follow flooding. Land thus furrowed can be irrigated more quickly and less water is necessary than is the case with the flood method, and as the work of getting the water on to the land is the most expensive item in irrigation the most economical method should be used.

Wherever possible, land should be thoroughly irrigated in the fall to insure a good supply of soil moisture for the growth of the crop the following spring. Where this is done there should be no difficulty in getting the crop far advanced the next season before irrigation is necessary. While newly broken sod land can not be put into good condition for irrigation the first summer, it might nevertheless be irrigated after midsummer and seeded to winter wheat.

MANURING.

An important factor which should be kept in mind by the farmer who has heavy soil, such as gumbo, is the need of getting organic matter

into the land. All available barnyard manure should be used on heavy land even though the land be new. The plowing under of green crops will also loosen up the soil, making it more congenial to plants and easier to cultivate. In general, the best time to apply manure is in the fall, and when practicable it should be plowed under at the same time.

THE BELLE FOURCHE EXPERIMENT FARM.

An experiment farm has been established on the Project about ten miles north of Vale, where experiments were carried on with problems pertaining to the area. Part of it will be under irrigation when water is available and part of it is now being used for experiments in dry-land agriculture. Any information which can be supplied by the station will be cheerfully furnished.

C. A. JENSEN,
Farm Superintendent.

Approved:

B. T. GALLOWAY,
Chief of Bureau.

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